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TITLE: Non-thermal plasma reactor design and single structural dielectric barrier

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INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nelson; David Emil	Independence Township	MI		
Li; Bob Xiaobin	Grand Blanc	MI		
Hemingway; Mark David	Columbiaville	MI		
Herling; Darrell R.	Kennewick	WA		
Baskaran; Suresh	Kennewick	WA		

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CLAIMS:

What is claimed is:

1. A single structural dielectric barrier non-thermal plasma reactor element comprising: an element having at least one cell comprising a conductor forming an electrode and terminal connector, said conductor comprising a conductive coating disposed in a print pattern on a single structural dielectric barrier; and an exhaust passage for flowing gas therethrough, so that during reactor operation, a non-thermal plasma is formed in said exhaust passage for treating gas as it passes through said exhaust passage; wherein individual cells of said element comprise a conductor-single structural dielectric barrier-exhaust passage-conductor arrangement.
2. The element of claim 1, wherein said cells comprise shapes selected from the group consisting of planar shapes, cylindrical shapes, swept shapes, plates, half-box shapes, C-shapes, and tube shapes.
3. The element of claim 1, further comprising: spacers selectively disposed so as to determine exhaust passage height in planar cells.
4. The element of claim 1, said conductor having a cut-out region disposed opposite said terminal connector for reducing potential voltage leaks.
5. The element of claim 1, wherein said conductive print pattern is selected from the group consisting of a solid pattern, a grid pattern, a partial print pattern, and combinations thereof.
6. The element of claim 1, wherein said conductive coating comprises a continuous grid pattern forming an electrode and terminal connector and having a cut-out region disposed opposite said terminal connector for reducing potential voltage leaks.
7. The element of claim 1, further comprising: end supports enabling said

exhaust passages to comprise ligament-free exhaust passages.

8. The element of claim 1, further comprising a cylindrical reactor element comprising: a large diameter dielectric tube having a conductor comprising conductive material disposed on interior surfaces of said dielectric tube and an uncoated surface section at each end of said dielectric tube; a structural conductive outer tube inserted over said dielectric tube, forming a ground electrode; electrical connections from outside to inside of said dielectric tube; and a device for securing said large diameter dielectric tube and said structural conductive metal tube.

9. The element of claim 8, wherein said securing device comprises a front centerpiece disposed at a front end of said cylindrical element, said front centerpiece having openings for receiving a plurality of connecting members; a back centerpiece disposed at a back end of said cylindrical element, said back centerpiece having openings for receiving a plurality of connecting members; a plurality of connecting members connecting said cylindrical element to said front and back centerpieces; wherein said securing device covers interior portions of said conductive coated dielectric tube providing ligament-free blocking of exhaust flow in desired regions.

10. The element of claim 9, wherein said front and back centerpieces have an intumescent ceramic layer on surfaces adjacent said dielectric tube and said conductor tube, thereby providing cushioning and compensation for thermal coefficient of expansion mismatch between said dielectric tube and said conductor tube.

11. The element of claim 8, wherein said large diameter dielectric tube comprises a diameter in the range of about 12 centimeters to about 25 centimeters and a length of about 10 centimeters to about 30 centimeters.

12. The element of claim 8, wherein said securing device comprises a shape suitable to effect reduced backpressure of said cylindrical reactor during operation.

13. The element of claim 12, wherein said securing device comprises a cone tipped shape.

14. The element of claim 1, wherein a single conductive print pattern is employed to form said conductor, said single pattern being oriented to provide a power orientation or a ground orientation to alternating reactor layers.

15. The element of claim 1, further comprising: an orientation feature, to provide ease of alignment during reactor assembly.

16. The element of claim 15, wherein said orientation feature comprises a truncated corner.